

FILE NO. ~~2-1648B~~ 2-1648A

DATE: April 7, 2000

CODE APPLICATION NOTICE

CODE SECTION: ~~1648B~~ 1648A, DIV ~~III-R~~ VI-R, Chapter ~~16B~~ 16A, Part 2, ~~1998~~ 2001
California Building Code

**~~SEISMIC RETROFIT OF SINGLE STORY HOSPITAL BUILDINGS UTILIZING,
WOOD FRAME OR LIGHT STEEL CONSTRUCTION~~**

~~1648B.1~~ 1648A.1 *The existing or retrofitted structure shall be demonstrated to have the capability to sustain the deformation response due to the specified earthquake ground motions. The engineer shall provide an evaluation of the response of the existing structure in its current configuration and condition to the ground motions specified. If the building's seismic performance is evaluated as satisfactory and the peer reviewer(s) [for OSHPD 1: and the enforcement agent] concurs, then no further engineering work is required. When the evaluation indicates the building does not meet the objective of the ~~Division III-R~~ safety goals of this division [for OSHPD 1: and the applicable structural seismic performance (SPC) and nonstructural seismic performance (NPC) requirements,] then a retrofit and/or repair design shall be prepared that yields a structure that meets the life-safety [for OSHPD 1: and operational] performance objectives of Section ~~1640B~~ 1640A of this ~~Division III-R~~ and reflects the appropriate consideration of existing conditions. Any approach to analysis and design may be used that yields a building of reliable stability in the prescribed design earthquake loads and conditions. The approach shall be rational, shall be consistent with the established principals of mechanics, and shall use the known performance characteristics of materials and assemblages under reversing loads typical of severe earthquake ground motions.*

Exception: *Further consideration of the structure's seismic performance can be waived by the Enforcement Agent if both the engineer-of-record and peer reviewer(s) [OSHPD 1: and/or Enforcement Agent] conclude that the structural system can be expected to perform at least as well as required by ~~Division III-R~~ the provisions of this division without completing an analysis of the structure's conformance to these requirements. A detailed report shall be submitted to the responsible Enforcement Agent that presents the reasons and basis for this conclusion. This report shall be prepared by the engineer of record. The peer reviewer(s) [OSHPD 1: and/or Enforcement Agent] shall concur in this conclusion and affirm to it in writing.*

PURPOSE:

The purpose of this CAN is to provide an acceptable approach for seismic retrofit of single story hospital buildings utilizing wood frame or light steel frame construction from SPC-1 level to SPC-2 level. These buildings are typically classified as "Building Type 1- Wood, Light Frame" or "Building Type 2- Wood, Commercial and Industrial" as specified in Section 2.2.3, Article 2, Chapter 6, Part 1, Title 24. This methodology does not apply to single story hospital buildings utilizing wood frame or light steel frame construction with roofing membrane (shingles, tile, etc.) weighing more than 10 psf.

INTERPRETATION:

The relative safety of single story light wood frame or light steel frame constructed buildings has long been recognized. These types of buildings were specifically excluded from the definition of “Hospital building” when used as a skilled nursing or intermediate care facilities [Health and Safety Code Section 129725(b)(2)]. Even though by calculation these buildings may evaluate as an SPC-1, we know from past experience that these building types survive earthquakes without collapse, provided that the building has certain attributes. These attributes include braced cripple walls, adequate connection to the foundation, and, in the case of larger light frame structures, regularly and closely spaced sheathed walls that extend from the foundation to the roof. The SPC-2 criteria is that “These buildings may not be repairable or functional but will not significantly jeopardize life” following strong ground motion. Although these buildings do not normally collapse, there are factors that may jeopardize life as they respond to an earthquake.

Therefore, single-story Building Type 1- Wood, Light Frame structures, and single-story “Building Type 2- Wood, Commercial and Industrial” structures, evaluated per Section 1.3.3, Article 1, Chapter 6, Part 1, Title 24, as an SPC-1 may be placed in category SPC-2 provided the following items have been mitigated and construction completed prior to January 1, 2008:

1. **Cripple Walls per Section 5.6.4, Article 5, Chapter 6, Part 1, Title 24:** This deficiency is considered mitigated with the addition of structural panel sheathing to the inside face of stud of the cripple wall. In addition, single-story hospital buildings utilizing wood frame or light steel frame construction with a floor area greater than 5,000 square feet, this deficiency is considered mitigated provided that the interior shear and or bearing walls are supported below the floor by cripple wall studs with structural panel sheathing and sill plates bolted to the foundation. An acceptable methodology for performing this work is the prescriptive procedure for the repair and/or retrofit of existing buildings specified by the Uniform Code for Building Conservation (UCBC), Appendix Chapter 6.
2. **Foundation Bolting per Sections 8.4.7, Article 8, Chapter 6, Part 1, Title 24:** This deficiency is considered mitigated with the addition of drilled-in anchors to provide the minimum bolt spacing per the structural evaluation procedure.
3. Vertical lateral-force resisting elements must be provided parallel to the length of the building so that, in each resisting direction, there is at least one vertical lateral-force-resisting element within 35 feet of any portion of the building length. Existing sheathed stud walls that extend from the foundation to the roof diaphragm shall be considered to meet this requirement. In buildings made up of multiple diaphragm segments, the vertical lateral-force resisting elements shall be directly attached to the diaphragm segment.
4. Where existing sheathed stud walls do not extend from the ceiling to the roof at a maximum spacing of 35 feet in each direction, existing walls shall be extended to the roof to obtain the maximum spacing of 35 feet. The 35 foot spacing is based on capacities of typical light frame wood building shear walls subject to the estimated earthquake demands calculated from Article 2, Chapter 6, Part 1, Title 24. When substantiated by

structural calculations, the 35 feet may be increased when the shear capacity and overturning stability of the shear walls is adequate. The extended wall portion in the ceiling space shall be anchored to the wall below at each end to resist uplift forces from the design seismic lateral load. The new studs shall be spaced at a maximum of 24 inches on center.

5. Bearing and non-bearing stud walls within the ceiling to roof space designated to resist in-plane seismic lateral forces shall be covered with sheathing on at least one side with nailing sufficient to resist the in-plane design seismic lateral force and to transfer that shear force from the roof diaphragm to the sheathed wall portion below. Where the existing sheathing of the wall below the ceiling is gypsum board or plaster, the new structural sheathing in the ceiling to roof space shall consist of gypsum board. The maximum shear capacity of the new gypsum board sheathing shall not be taken to be greater than 100 pounds-per-linear foot (5d nails at 7 inches on center). The maximum shear capacity of walls with gypsum board sheathing on two sides shall not be taken to be greater than 200 pounds-per-linear foot (5d nails at 7 inches on center).

The maximum height (from roof to floor)-to-width ratio of the stud wall shall not exceed 1:1 in order to be considered as resisting the in-plane seismic lateral force. This limitation is based on the stability of the shear wall considering that there are no designed holdown anchors at the ends of the wall at the floor level.

REASON:

This Code Application Notice is provided to address the recognized performance of these building types. It is the Office's interpretation of Section ~~1648B.1~~ 1648A.1 which states "Any approach to analysis and design may be used that yields a building of reliable stability in the prescribed design earthquake loads and conditions".

ORIGINAL SIGNED

Kurt A. Schaefer

8/25/04

Date